

Appropriate Agricultural Innovations for the challenges of the 21st Century



USDA Seminar

**Royal Over-seas
League
London,**

**September 28th,
2010**

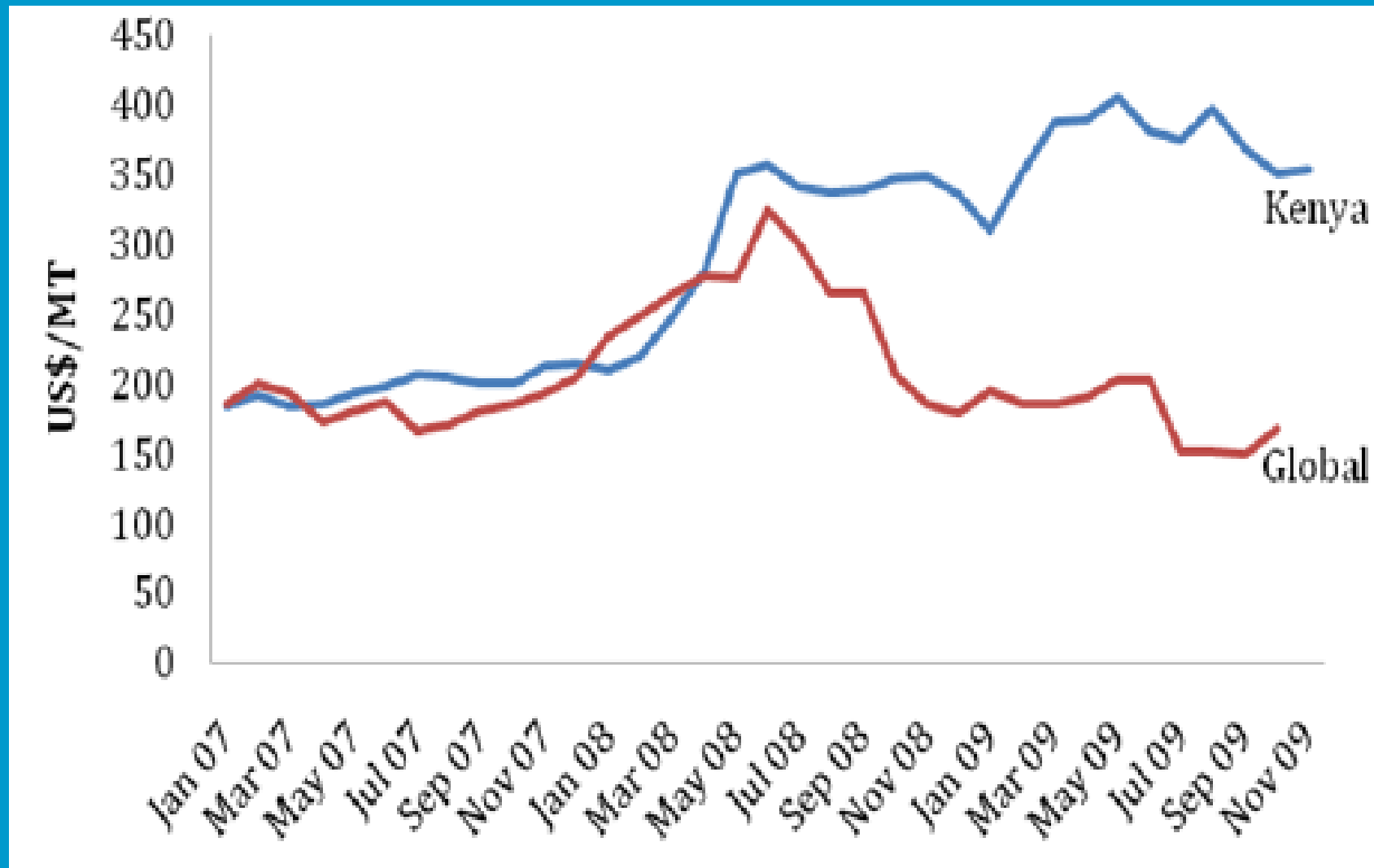
Gordon Conway, Imperial College

FAO Food Price Index

2002-2004=100



Maize Prices in Kenya



As a result

at end of 2009

1.02 billion people,

1 in 6 of the world's

population, chronically hungry

**and we have to increase food
production by 70-100% by
2050**

An English Cottage Loaf



**Immediate
Crisis
on top**

***twisting out
of***

**Chronic Crisis
beneath**

The Global Crises

Financial

Terrorism

Food security

Energy Supply

‘A Perfect Storm’

Water

**Loss of Ecosystem
Services**

Climate Change

Underlying the spike is a chronic crisis which is getting worse

- **The Drivers**

- **Rising populations**
- Rising per capita incomes
- **Growing demand for livestock products**
- Rising fuel and fertiliser prices
- **Growing demand for biofuels**
- Increasing water and land scarcity
- **Impact of climate change**
- Slowing of productivity increases

If food prices are high why can't Developing Country farmers respond?

- Lack of inputs
 - **High costs of fertilisers**
 - Inappropriate technologies
 - **Poor land tenure**
 - Lack of water
 - **Poor extension**
 - Variable and unreliable markets
 - **Poor infrastructure**
 - etc
-
- **But the mix varies from place to place**
 - **We urgently need new diagnostics, country by country, state by state**

How do we judge an intervention is appropriate ?

- Does it work?
- Does it add significant value?
- Is it resilient?
- Is it equitable?
- Are there downsides?
- What is the counterfactual?

Appropriate Technologies

- Traditional
- Intermediate
- Conventional
- New Platform Technologies

A Javanese Home Garden



Artemisia annua



Argan oil



Intermediate Technologies

Adaptation measures in Ningxia

■ Drought:


■ Farmer level

- Plastic film
- Change to plant other crops
- Cover small stone
- Terrace
- Saving water irrigation
- Water cellar
-





Treadle pump and drip irrigation



Rasike Farm, Chililila WG. MBILI maize-soyabean intercrop providing 1215 kg maize and 545 kg soyabean per ha when conventional intercrops failed. These results indicate that MBILI is a means toward greater food security.

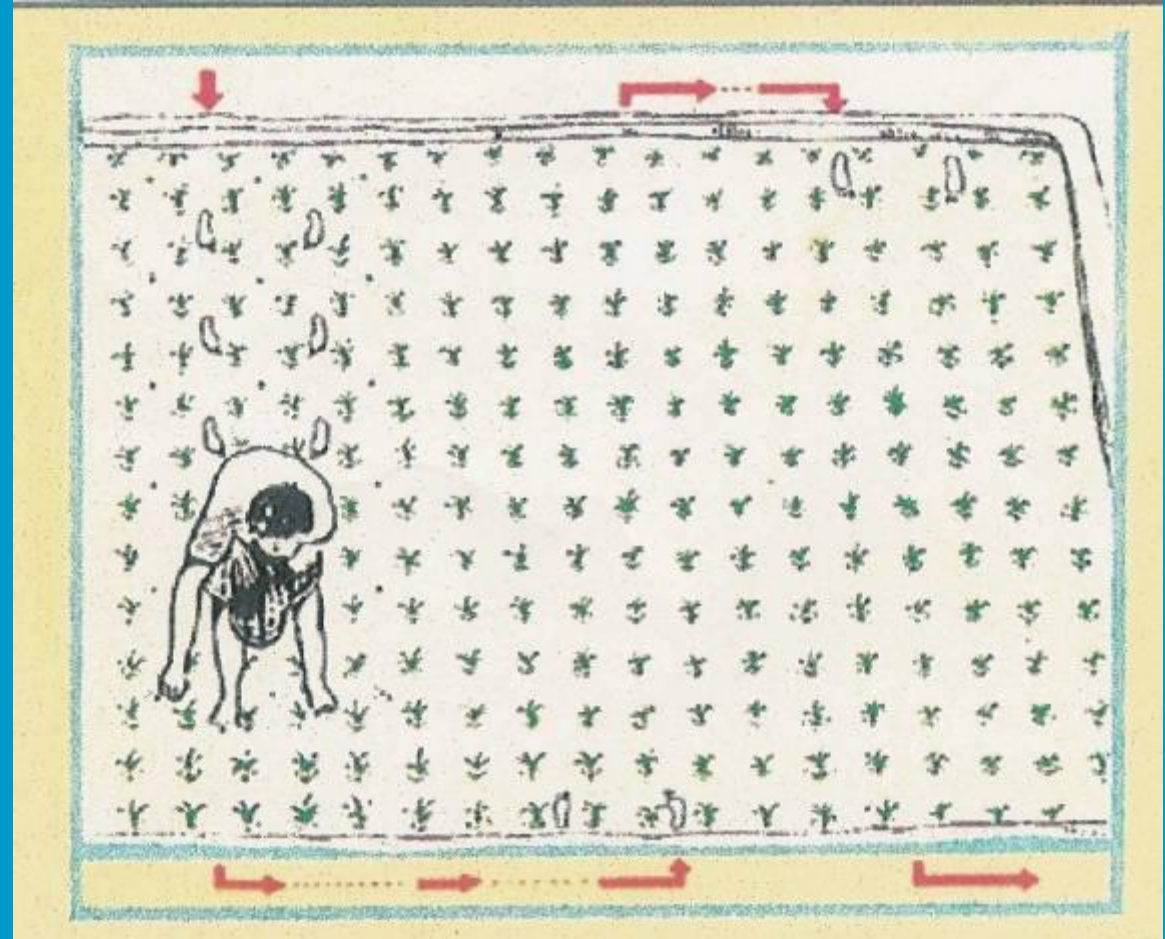


Wamalwa Farm, Siritanyi FFS, Kanduyi. Maize-groundnut intercrop providing 5330 kg maize and 1203 kg groundnut per ha. These results indicate that MBILI can produce significant food surpluses.

Conventional Technologies

but more precise

Deep Placement of USG briquettes in paddy



Controlling Striga



- 2.4 m ha
- \$380m loss
- Maize resistant to Imazapyr
- Coat seed, herbicide kills Striga
- BASF, Weismann. CIMMYT, IITA, NARS, NGOs

New Platform Technologies

Biotechnologies

Nanotechnologies

Information and Communication
Technologies

Biotechnologies

Building Productivity and Sustainability into the Seed or the Animal

- **Increasing nutrient uptake efficiency**
- **Improving nutritive value**
- **Countering the new pest and disease outbreaks**
- **Increasing drought tolerance**
- **Increasing water use efficiency**

Marker aided Selection



**Monsanto's
Chipper**

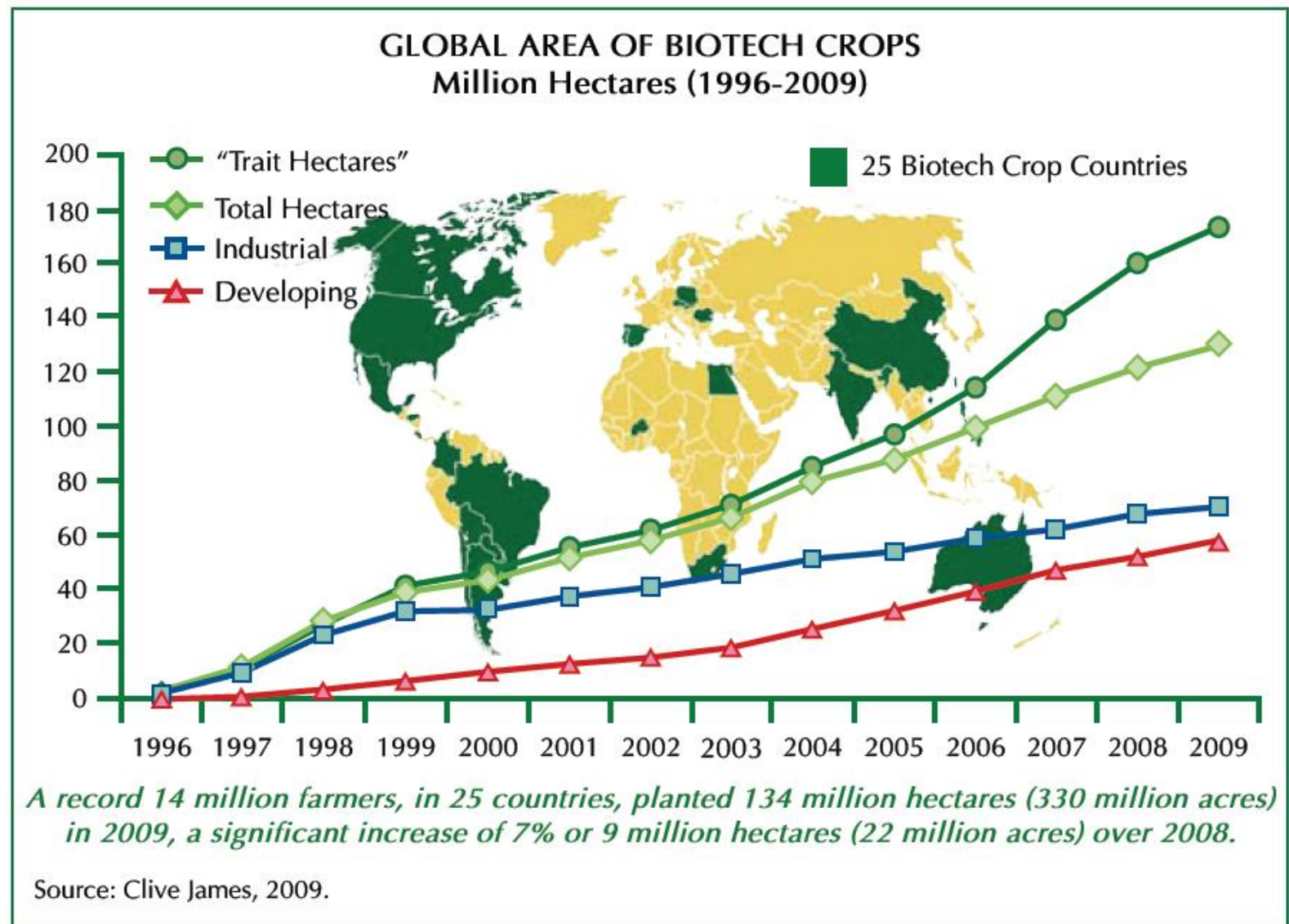
The New Rices for Africa



**Monty Jones
2004**



Recombinant DNA or 'GM' Crops





Uganda

Golden Rice



Potential Nanotechnology for Agriculture

- Nanoporous zeolites for slow-release and efficient dosage of water and of fertilizers for plants, and of nutrients and drugs for livestock
- **Nanocapsules for herbicide delivery**
- Nanosensors for soil quality and for plant health monitoring
- **Nanomagnets for removal of soil contaminants**

Mobile Phones for Farming



- *AppLab*,
- Grameen Foundation,
Google and MTN Uganda,
- Platforms
 - *Farmer's Friend*, searchable database of agricultural information,
 - *Google SMS*, question and answer texting service
 - *Google Trader*, a SMS-based "marketplace" application that helps buyers and sellers find each other

Market driven technologies



Loess Plateau China





Loess Plateau, China



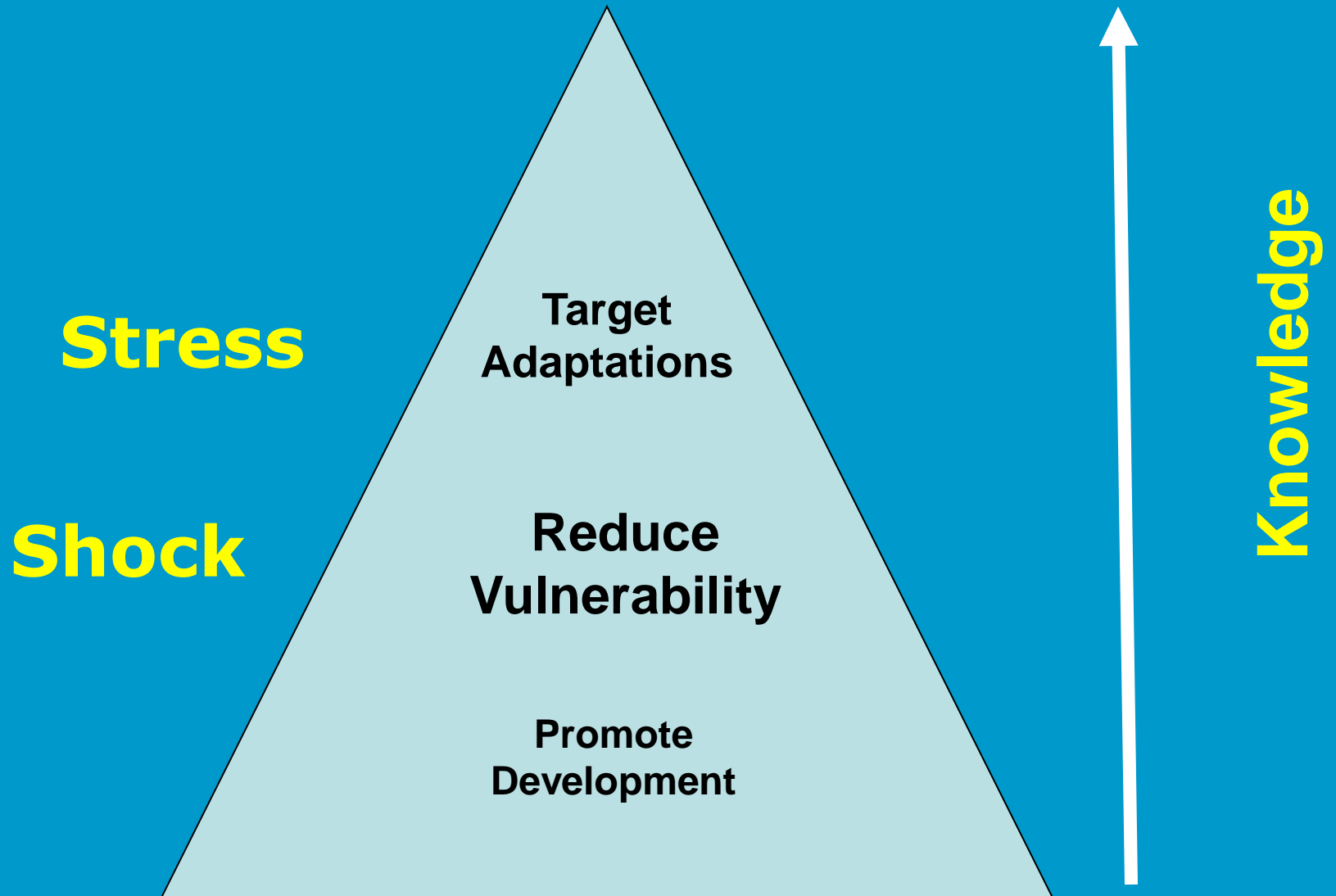
Rwanda

Bourbon Coffee

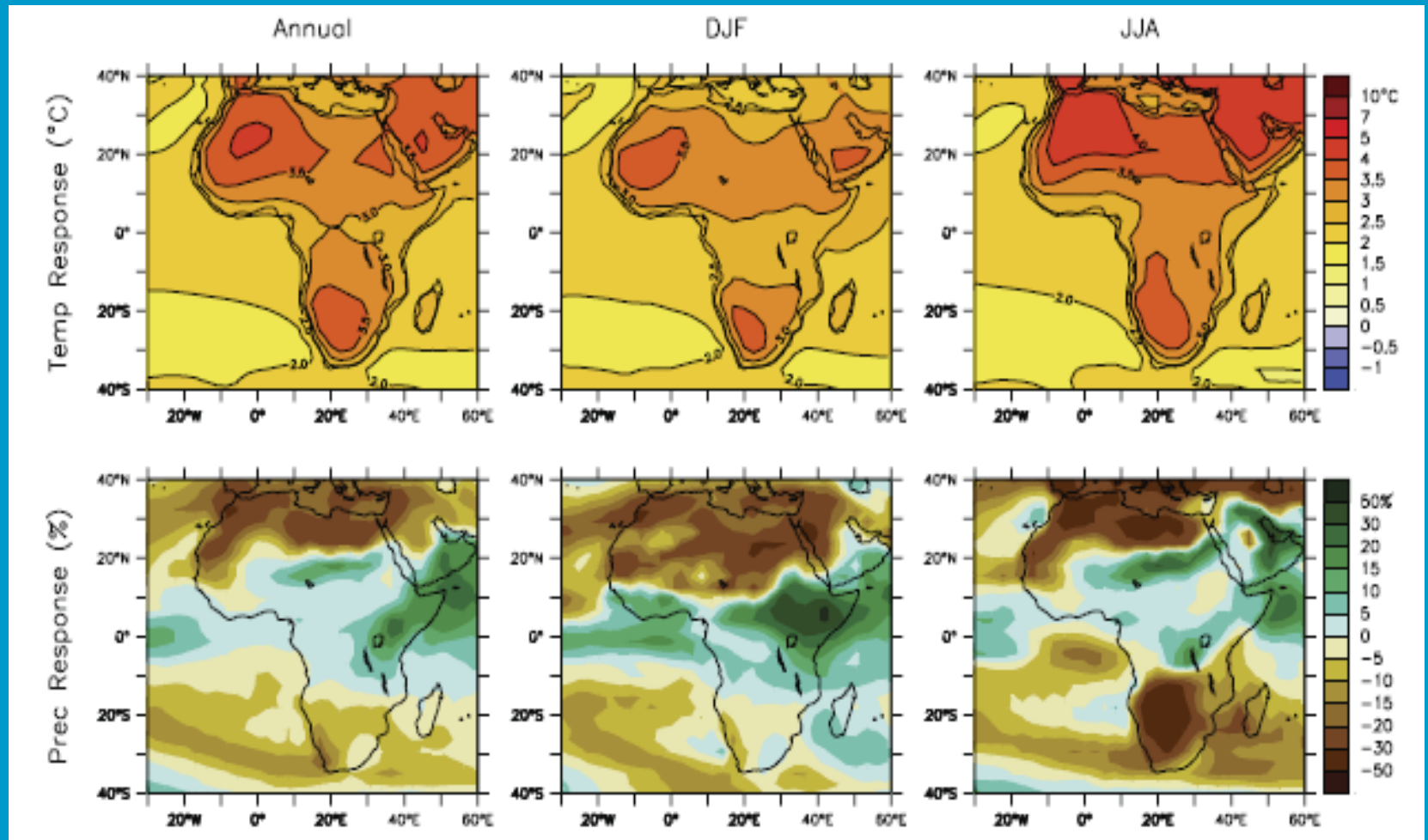
**Getting the
Quality Control
right**



Pyramid of Adaptation



Temperature and rainfall projections, 1980 to 1999 versus 2080 to 2099



scenario A1B

Conservation Farming in Zimbabwe



Ploughed



3 years minimum

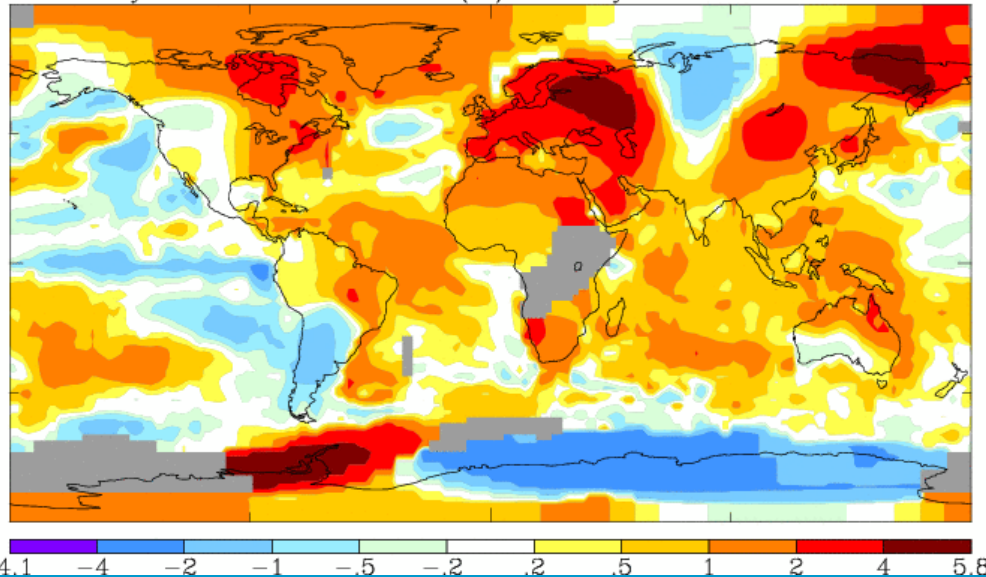
**In many places droughts
and floods will occur with
greater frequency and
intensity**

**How do we build Resilient
Livelihoods?**

July 2010

L-OTI(°C) Anomaly vs 1951-1980

.55



Russia and Pakistan, 2010

Logistics cluster, Islamabad

Goddard GHCN_GISS_HR2SST_1200km
_Anom07_2010_2010_1951_1980

